

THE SCALY WINGED COPEOGNATHA (*Monograph of the
Amphientomidæ, Lepidopsocidæ, and Lepidillidæ in relation
to their Morphology and Taxonomy*).

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With Plates A-G and six text figures.

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INTRODUCTION.

IN India, the Wonderland of Antiquity, there may yet remain many a secret unrecognized and unsuspected. It is my good fortune to raise the curtain upon an admirable nature-play; minute insects, in appearance resembling microlepidoptera and not second to these in elegance and beauty of tint of the scaly covering, and yet only simple* "woodlice," a series of forms of the most varied description, of which only scanty fragments have hitherto been reported upon, here enjoy their obscure existence.

I am indebted to Mr. E. Ernest Green, the Government Entomologist at Peradeniya, Ceylon, for the opportunity of examining a rich collection of these exquisite animals from Ceylon. Doubtless numerous other species will still be found in the Indian Region, and the specimens which have occasionally reached my hands from the tropical regions of other parts of the world only indicate what a wealth of forms may yet be expected.

For a long time I had contemplated a monographic investigation of the scale-bearing Copeognatha, so that I gladly seized the opportunity to realize this idea, the more so because the abundant material from Ceylon put me into a position to finally establish and accurately illustrate a series of types described by Hagen from Ceylon in 1858 and 1859.

My hearty thanks are due to my friend and esteemed colleague, Professor F. Karsch, since I have only been able to carry this work through by the use, at home, of his excellent Zeiss-microscope.

In the following pages the morphological details will be found under the several families.

PRESERVATION AND PREPARATION.

For the preservation of scaly Copeognatha and of scaly insects in general the use of alcohol or of other fluids is in no case to be recommended, because the scales are mostly detached in the fluid and the design of the scale-covering can therefore no longer be recognized.

The scale-bearing Copeognatha are best preserved dry, and should be mounted upon minute needles of hard nickel and fixed on cubes of pith or better still upon small cardboard slips, the so-called

* The term 'woodlice'—as used by Dr. Enderlein—must not be confused with the crustacean animals popularly known by that name in England. The subjects of this paper are true insects, belonging to a family of which the commoner species are recognized in England by the name 'booklice.'

minimal labels [Minutienklebzettel], according to the system of Ortner, Vienna. Morphological details can be studied in examples which have been softened in caustic potash, so that, on the whole, alcoholic material can be dispensed with. Before softening a unique specimen a precise description of it must be provided. Above all, the wings should be carefully removed before the softening process; one pair should be preserved dry between two cover-glasses rimmed with wax; the other pair can, if necessary, serve for a Canada balsam preparation.

As I have indicated on a former occasion* and then again, in greater detail, later,† the method of softening is as follows:—

The insect is transferred carefully into a mixture of one part of moderately strong caustic potash and about 8–10 parts of water; (winged insects after removal of the wings); except when dealing with very delicate animals, in which case the solution of caustic potash should be weaker. According to size and delicacy of the object it remains from ten minutes to several hours in the fluid, until it recovers approximately the natural form; then it is transferred to water, where it must be watched since it now begins to swell. The larger air-bubbles are next carefully removed with a fine brush, and eventually the object is again placed in the dilute caustic potash. Here it can remain, at convenience, a longer or a shorter time; even delicate examples can be left in the fluid for several days if the caustic potash is not too strong.

If the object presents black and dark-coloured chitin, it is often necessary to leave it in the solution for a long time in order to dissipate the pigment completely.

Finally, after the object has been washed out with water, it is transferred gradually into alcohol, where the smaller air bubbles can be easily removed. The animal can now be preserved in 96 per cent. alcohol, and it retains perfectly the natural form which it had regained in the caustic potash. If a permanent microscopic preparation is desired, the contents of the body should be removed as far as possible by pressure with a fine brush, and the object having been properly orientated, is treated first with absolute alcohol, then with cedar oil, and finally mounted in Canada balsam. Cedar oil is to be preferred to clove oil, xylol, or benzol because the diffusion of fluids takes place much slower and consequently shrinkages rarely occur.

* Günther Enderlein. Eine Methode, kleine getrocknete Insecten für mikroskopische Untersuchung vorzubereiten in Zool. Anz. Bd. 27, 1904. pp. 479–480.

† Enderlein, Monographie der Coniopterygiden, Zool. Jahrb. Syst. Bd. 23. 1906 (pp. 173–242), see pp. 174–176.

When however the chitinous cuticle is very thin, it is impossible to avoid shrinkage if the object is mounted in Canada balsam: in such cases it should be transferred from the water into glycerin.

For permanent glycerin preparations the following is the best method:—The cover-glass, over which no glycerin must be allowed to escape, is fastened to the slide by means of a rim of wax which is applied by a wax taper or wax match which has been lighted and immediately extinguished; the wax border can then be covered over with Canada balsam or gold size.

Teasing up the object with needles can only be effected successfully in Canada balsam or glycerin.

In dealing with delicate objects, the dilute caustic potash should not be heated, as the chitin is liable to change to a tenacious substance which will cling to the needles used in the preparation.

GEOGRAPHICAL DISTRIBUTION.

The Amphientomidæ, Lepidopsocidæ, and Lepidillidæ belong almost exclusively to the Tropics. Only two species occur in the sub-tropical region, namely, an Amphientomid, *Stimulopalpus japonicus*, nov. gen., nov. spec., in Japan, and one Lepidillid, *Lepidilla Kelloggi*, Rib., in California. One species only occurs in the Temperate zone, namely, *Echmepteryx Hageni*, Pack., in the United States.

The three families contain together nineteen genera; of these three were described by Hagen (1859–1866), one by Ribaga (1905), one by Aaron (1886), and fourteen by me.

Up to the present, forty-four species belonging to these nineteen genera are known, of which one was described by Packard, one by Ribaga, nine by Hagen, and thirty-three by me. Of the last twenty-two species are established in the present work.

TABLE OF THE RECENT AND FOSSIL SCALY COPEOGNATHA.

Fam. AMPHIENTOMIDÆ. Enderl. 1903.

Sub-fam. TINEOMORPHINÆ. n.

I.—*Tineomorpha*, nov. gen.

1. *Greeniana*, n. sp. Ceylon.

II.—*Cymatopsocus*, Enderl. 1903.

2. *opalinus*, Enderl. 1903. Further India.

Sub-fam. AMPHIENTOMINÆ, Enderl. 1903.

III.—*Syllysis*, Hag. 1866,

3. *caudata*, Hag. Ceylon.

4. *erato*, n. sp. Ceylon.

5. *ritusamhara*, n. sp. Ceylon.

IV.—*Amphientomum*, Hag. 1856.

6. *paradoxum*, Pict. Hag., 1856. in amber.

7. *leptolepis*, Enderl., 1905, in amber.

8. *colpolepis*, Enderl., 1905, in
amber.
- V.—*Paramphientomum*, n. g.
9. *Nietneri*, n. sp. Ceylon.
- VI.—*Stimulopalpus*, n. g.
10. *japonicus*, n. sp. Japan.
- VII.—*Seopsis*, n. g.
11. *vasantasena*, n. sp. Ceylon.
12. *superba* (Hag., 1865). Ceylon.
13. *metallops*, n. sp. Ceylon
- VIII.—*Hemiseopsis*, n. g.
14. *Fülleborni*, Enderl. 1902.
East Africa.
- IX.—*Stigmatopathus*, Enderl.
1903.
15. *Horváthi*, Enderl. Further
India.
- Fam. LEPIDOPSOCIDÆ, En-
derl. 1903.
- Sub-fam. PERIENTOMINÆ, En-
derl. 1903.
- X.—*Soa*, Enderl. 1904.
16. *Dahlia*, Enderl. 1904.
Bismark Archipelago.
17. *flaviterminata*, n. sp. Ceylon.
- XI.—*Perientomum* Hag.
1865.
18. *trichopteryx*, Hag. 1859.
Ceylon.
19. *chrysargyrium*, n. sp.
Ceylon.
20. *gregarium*, Hag. 1865.
Ceylon
21. *Greeni*, n. sp. Ceylon.
22. *morosum*, Hag. 1865. Ceylon.
23. *triste*, Hag. 1865. Ceylon.
24. *ceylonicum*, n. sp. Ceylon.
25. *argentatum*, n. sp. Ceylon.
26. *acutipenne*, n. sp. Ceylon.
27. *incultum*, Hag. 1865. Indian
Copal.
- XII.—*Lepium*, n. g.
28. *chrysochlorum*, n. sp. India.
29. *luridum*, n. sp. Ceylon.
- XIII.—*Nepticulomima*, n. g.
30. *Sakuntala*, n. sp. Ceylon.
31. *Essigkeana*, n. sp. Ceylon.
32. *Hösemanni*, Enderl. 1903.
Cameroons.
33. *brasiliensis*, Enderl. 1906.
Brazil.
34. *Biróiana*, Enderl. 1903. New
Guinea.
35. *chalcomelas*, n. sp. Ceylon.
36. *mortua* (Hag. 1865) Zanzibar
Copal.
- Sub-fam. LEPIDOPSOCINÆ.
Enderl. 1903.
- XIV.—*Echmepteryx*, Aaron.
1886.
37. *Hageni* (Packard, 1870).
North America.
38. *mihara*, n. sp. Ceylon.
39. *sericea*, n. sp. Ceylon.
- XV.—*Lepidopsocus*, Enderl.
1903.
40. *Nepticulides*, Enderl. 1903.
Further India.
- Sub-fam. ECHINOPSOCINÆ,
n.
- XVI.—*Echinopsocus*, Enderl.
1903.
41. *erinaceus*, Enderl. 1903.
New Guinea.
- XVII.—*Scolopama*, n. g.
42. *halterata*, n. sp. Ceylon.
- Fam. LEPIDILLIDÆ
(Ribaga, 1905).
- XVIII.—*Lepidilla*, Rib. 1905.
43. *Kelloggi*, Rib. 1905. Califor-
nia.
- XIX.—*Lepolepis*, n. g.
44. *ceylonica*, n. sp. Ceylon.

TABLE OF COMPARISON OF THE AMPHIENTOMIDÆ, LEPIDOPSOICIDÆ,
AND LEPIDILLIDÆ.

	AMPHIEN- TOMIDÆ.	LEPIDOPSOICIDÆ.	LEPIDILLIDÆ.
Head	.. Glabrous or nearly so	With long hairs generally close-set	With long and shaggy hairs
Occipital margin	Sharp	Sharp	Sharp
Eyes	.. Glabrous (except in Tineomorphinæ)	Pubescent	In front or also in the middle finely pubescent
Ocelli	.. 0, 2 or 3	0, or 3	0
Joints of antennæ	13	About 21-47	More than 50
Inner lobe of maxilla	Spatulate, irregularly toothed	With 3 apical points	With 3 apical points
Terminal joint of the maxillary palp	Long and slender	Short, strongly widened, truncate at the end, like an axe	Short, strongly widened, truncate at the end, like an axo
Maxillary palp-organ	In the form of a sense-papilla; in the Tineomorphinæ a long sense-hair	In the form of a short sense-papilla	In the form of a short sense-papilla
Prothorax	.. Small, concealed below the mesothorax	Large and broad, visible from above	Large and broad, visible from above
Scales on the legs	Femora tibiæ and first tarsal joint	Femora and tibiæ	Ends of the femora and bases of the tibiæ
Teeth on the claws	1-2; also about 1-10 fine hair-like or thorn-like denticulations	1, rarely traces of more, without hair-like denticulations	1
Hind-tibiæ (over the entire length)	Beset with very short and fine spur-like thorns	With a great number of unusually long and strong bristles on the outer side, some of them nearly half the length of the tibia	With numerous long and strong bristles; middle tibiæ also with long and strong bristles
Thorn-shaped anal appendages on the lateral valves of the telson	Absent	Present	Present
Fore wings	.. With veins; on the outer side usually rounded, rarely drawn out to a point at the front edge; sometimes with a tail-like appendage in the middle of the outer margin	With veins; usually more or less strongly acuminate, sometimes with long thin apex; only in <i>Soa</i> , Enderl., is the outer margin rounded.	Small, scale-like; without veins

	AMPHIEN- TOMIDÆ.	LEPIDOSOCIDÆ	LEPIDILLIDÆ.
Scales of fore wing (excluding the marginal scales)	Equal; in the Tineomorphinæ only are there ground - scales and covering scales	Ground-scales and covering scales; or asymmetrically knife-shaped	Equal
Between the scales of the fore wing.	Numerous very fine and short hairs	No fine and short hairs but only scattered long and strong hair-like scales	Neither hairs nor hair-like scales
Marginal vein ..	Scarcely perceptible; without cross rows of hair-cupules; chiefly scaled	Sharply demarcated; with cross rows of projecting round hair-cupules; chiefly hairy	Absent
Anal and Axillaris	End in one point (Nodus) as in all other Copeognatha	Never end in one point	—
2. Axillaris ..	With the exception of <i>Stigmatopathus</i> , Enderl., constantly present	Absent	—
Very long and strong bristles (macrochaetae), which stand vertically upon the marginal zone (especially the subcostal cell) and on the veins	Absent	Present	—
Hind wings ..	Front and outer border scaly, as well as the apical membrane usually; in the Tineomorphinæ almost the whole surface	Without scales, only pubescent; in the Echinopocinæ they are strongly reduced or absent	Absent
Media ..	Simple, only in the Tineomorphinæ forked	Two distinct branches	—
Radius and median trunk	Widely separated; a large cell intervening	Coalesced or only an extremely narrow and long cell between	—
Radial ramus and Media	United by a cross vein which serves as the basis of both	Fused at the base r_1 therefore appears to arise from the media or the radial ramus	—

Fam. AMPHIENTOMIDÆ.

[Enderlein. Ann. Mus. Nat. Hung., Bd. I, 1903, p. 206.]

Head, large, hairless, or with very short hairs; eyes and clypeus very slightly projecting. Occiput very steeply declining and sharp-edged; the margin somewhat rounded. Eyes moderately large, hairless, except in the Tineomorphinæ, where they are compactly and shortly pubescent.

The three ocelli of the Amphientominæ are rather far apart, but always form a small triangle; the anterior ocellus generally smaller (only larger in *Seopsis metallops*, n. sp.); the ocelli are sometimes absent (*Stigmatopathus*, Enderl.); the Tineomorphinæ have only two ocelli which lie more or less close in front of the border of the compound eyes. Maxillary palp 4-jointed, the first joint very short, the last long and slender. Inner lobe of the maxilla strongly widened at the end and very irregularly notched and flatly dentate. Organ of the maxillary palp, in the Amphientominæ, in the form of a short sense-club; in the Tineomorphinæ it has the form of a remarkably long sense-hair on the inner side of the second joint of the palp. Labial palp 2-jointed, but the two joints grow to a large roundish disc-like structure close together (as figured in the case of *Cymatopsocus*, Enderl., in Ann. Mus. Nat. Hung., Bd. I, 1903. Plate XII., fig. 56 i).

Flagellum of the antenna thin to very thin, rather closely beset with long to very long hairs. Antenna short, two-thirds to three-quarters the length of the fore wing. The number of the long antennary joints is in all cases, recent and fossil, thirteen. Hagen (Ent. Zeit. Stettin, 1882, p. 268) states that the antennæ of *Amphientomun paradoxum*, Hag., from amber, are 15-jointed. I have however been able to convince myself by examination of Hagen's material that the species which occur preserved in amber have also only 13 antennary joints (cf. Enderlin, *l.c.*, 1905, p. 576). In consequence of the extraordinary and unusual length of the very thin antennary joints it is very difficult to count them with certainty in the amber.

Prothorax small, compressed below the mesothorax, and not visible from above; mesonotum beset with scales. Femora, tibiæ, and first tarsal joint beset with slender scales. Hind tibiæ with very short and fine spur-like thorns scattered along the entire length. Hinder tarsal joints with a series of *ctenidiobothria* (fig. 123) on the inner side. Tarsi 3-jointed. Claws with one tooth before the apex (*Stimulopalpus*, Enderl.; *Seopsis*, Enderl.; *Stigmatopathus*, Enderl.); or with two teeth (*Amphientomum*, Hag., 1859.

Paramphientomum, n. g., *Syllysis*, Hag., and in the Tineomorphinæ); between the tooth or teeth and the basal angle a row of about 4-6 or more (about 10 in the Tineomorphinæ), bristle-like, partly expanded or almost tooth-like chitinous processes, like the teeth of a comb; these are more or less strongly inclined towards the apex.

Fore wing normally rounded on the outer side, sinuous (*Cymopsocus*, Enderl., 1903), or the apex is more or less produced, or in front of the middle of the outer border there may be a thin tail-like process. Subcosta moderately long, its distal portion shutting off the pterostigma at the base may be absent (*Seopsis Fülleborni*, Enderl., 1902, and *Paramphientomum Nietneri*, n. sp.); according to the size of the pterostigma, it is more or less long.

R_2 , straight; the triangular pterostigma may be narrow and long, or broad and short, sometimes very small; it is cell-like, not strongly chitinised but membranous. The distance between the place of branching from the radial ramus and the pterostigma is long to very long. The stigma-sac is a more or less thickened spot on the lower side of r_1 in front of the pterostigma or at the base of the distal portion of the subcosta. Radial ramus united with the media by a short cross vein which meets the media inside of the three median branches or between the second and third median branch (Tineomorphinæ). Areola postica large to very large, usually elongate; cu_2 , more or less long; analis (*an*) and axillaris (ax_1) constantly end in one point called the nodulus; there are two axillary veins.

Hind wings:—In *Amphientomum* and in the Tineomorphinæ, r_1 terminates near the end of r_{2+3} at the anterior border, but is absent from all other recent forms (except the Tineomorphinæ) where the radius ends at the point of ramification of the radial ramus. The basal portion of the radial ramus, which appears as a cross vein may, as well in fossil (*Amphientomum*) as in recent forms (*Seopsis*, n. g.), be present or absent; in the latter case it is frequently feebly indicated. Media and cubitus simple, the latter forked in the Tineomorphinæ, axillaris rather long. Radial ramus and media united by a cross vein which serves as the base of both.

Fore and hind wings without prominent marginal vein. Membrane of fore wing closely scaled; between the scales numerous very fine and short hairs (absent from the Lepidopsocidæ). Outer margin of hind wing scaled and at the same time bearing long hairs, generally a more or less broad zone at the outer border also scaled (in *Amphientomum metallops*, n. sp. alone the scaling of the membrane is completely absent); hinder margin with very long hairs;

in the Tineomorphinæ the scaly zone is very broad and extends along the entire hind border.

The scales of the fore wing may have parallel sides, or the latter may converge towards the base; they are more or less slender, slightly curved at the end, generally truncate or emarginate, differing according to the species. Marginal scales slender to hair-like, thin and long, rounded at the end, directly truncate or more or less deeply bidentate. In the Tineomorphinæ the scales of the fore wing have become still further differentiated; in addition to the ground scales there are at various points still larger covering scales.

The scaleless *Empheriinae* and *Psyllipsinae*, which I formerly placed with the Amphientomidæ, constitute together a special family which I name the *Empheriidae*. Perhaps the *Thylacinae* (Enderlein, 1903) also belong to this family as a third sub-family, cf. page 77, footnote.

TABLE FOR THE DETERMINATION OF THE SUB-FAMILIES OF AMPHIENTOMIDÆ.

	TINEOMORPHINÆ.	AMPHIENTOMINÆ.
Cross vein between radial ramus and media in the fore wing	Discharging between m_2 and m_3 .	Discharging basalwards from m_3 .
Media in hind wing ..	Forked	Simple.
Eyes	Pubescent	Glabrous.
Ocelli	Two, immediately in front of the eyes	None or three, placed relatively close together.
Organ of maxillary palp	Long sense-hair	Short sense-club.
Scales of fore wing excluding the marginal scales	Ground-scales and cover-scales	Equal.
Sealing of hind wing ..	Nearly the entire surface, front border and outer border	The membrane of the wing-apex (the latter being scaleless), the front margin and outer margin.

Sub-fam. TINEOMORPHINÆ.

TABLE FOR DETERMINATION OF THE GENERA OF TINEOMORPHINÆ.

Outer margin of the fore wings smooth;
 the ocellus lying in front of each eye
 nearly touches the border of the eye .. *Tineomorpha*, n. g.

(Type *T. Greeniana*, n. sp.).

Outer margin of the fore wings with two sinuous emarginations; the ocellus in front of each eye is farther removed from the eye-border than the length of its diameter *Cymatopsocus*, Enderl., 1903.
(Type *C. opalinus*, Enderl., 1903.)

Tineomorpha, n. g.

Two ocelli close in front of the eye-borders, nearly touching the latter. Terminal joint of the maxillary palp long, not thickened at the end; organ of the maxillary palp not in the form of a sense-club but a long sense-hair (fig. 97 *sh*). Inner lobe of the maxilla (fig. 100) strongly expanded at the end, with strong flattened and blunt teeth. Eyes closely and shortly pubescent. Claws with two powerful teeth before the apex and behind these a row of 9-10 acute, very fine denticles curved backwards.

Wings (fig. 25 and 26) with smooth border, particularly the outer border is perfectly smooth, neither emarginate nor sinuous. The portion of the subcosta which shuts off the pterostigma at the base is clearly formed and long. The cross vein between media and radial ramus in the fore wing discharges between the points of insertion of the second and third median branches (m_2 and m_3). Two axillary veins (ax_1 and ax_2) in the fore wing.

Fore and hind wings scaly. Scales of the fore wing more or less long, round, and truncately bent at the end, or rounded; scales of two kinds, smaller ground-scales and larger cover-scales. Marginal scales slender, emarginate at the end. Scales of the hind wing slenderer, often emarginate in front; marginal scales very slender, at the hinder border hair-like.

The form of the scales agrees completely with the genus *Cymatopsocus*, Enderl., 1903.

One very large species from Ceylon.

Tineomorpha Greeniana, n. sp. (figs. 1, 25, 68, 94, 97, 100).

Head reddish brown, with close and flat silver gray pubescence. Occiput sharply declivous, rounded, somewhat concave. Suture of the vertex fine; suture very distinct between vertex and front, terminating laterally at the antennary groove which lies close in front of the eyes. The two ocelli relatively large, brown, nearly touching the borders of the eyes to the inner side of the antennary grooves. Front (forehead) rather long, flat. Clypeus moderately projecting. Upper lips fairly smooth, blackish-brown. Cheeks somewhat

expanded in a lobe-like manner, brownish yellow. Antennæ short, about two-thirds the length of the fore wing, 13-jointed, blackish gray, the two basal joints and the third and fourth joints reddish brown, the pubescence gray, oblique and moderately close; in the male compact, fairly erect and longer. Eyes closely and extraordinarily shortly pubescent, standing off somewhat laterally, in the male rather more so; temples displaced by the eyes. Inner lobe of the maxilla (fig. 100) strongly expanded at the end with strongly flattened and blunted teeth. Maxillary palp (fig. 94) blackish brown, apex of the terminal joint brownish yellow; third and especially the second joint with slender scales between the hairs, particularly at the outer side (fig. 97); the palpal organ of the second joint which is here developed as a sense-hair (fig. 97 *sh*) is shorter than half the length of the joint.

Mesothorax black above, covered with glistening straw-coloured scales. Parapsidal furrows very indistinct. Abdomen pale brownish, rather closely beset with silvery gray hairs; without scales. Legs brownish yellow, the brown colour as follows:—Anterior border of the coxæ, a broad diffused ring in the middle and the apex of the upper side of the femora, the tibiæ with exception of the base, the apex, and a ring before the centre, in the anterior and mid-tibiæ a small spot upon the upper side of the extreme base; the base of the first tarsal joints, as well as the second and third tarsal joints. The anterior femora are more strongly expanded than the rest.

Claws (fig. 68) large, slender; between the two powerful teeth before the apex, a smaller; between the inner angle and the first tooth a series of 9–10 acute, backwardly curved, very fine denticles.

Length of hind tibia $1\frac{1}{2}$ mm.; on the inner side six spurs, and in addition on the inner side at the end four spurs, on the outer side two spurs, all spurs without ctenidiobothria. The length of the first, second, and third joints of the posterior tarsi is 1.16 mm., 0.13 mm., and 0.15 mm. respectively, *i.e.*, in the approximate ratio $8\frac{1}{3} : \frac{1}{3} : 1$. The first posterior tarsal joint with 43 short and small ctenidiobothria. Femora and tibiæ beset throughout their whole length with narrow, truncate scales which are silvery on the clear areas, brown on the brown tract.

Fore wings dull straw colour to grayish white, marbled with labyrinthine design (fig. 1). Front margin with 8–9 strongly marked dark brown spots interrupted by clear spots. Veins brown.

Hind wings with exception of the centre rather closely scaled whitish gray to pale brownish, hind border densely pubescent. Membrane of the hind wing brightly iridescent green to red.

Membrane of the fore wing dull opaque grayish white. The remarkable opalisation of the wings of *Cymatopsocus opalinus*, Enderl., 1903, is quite absent here.

The veins (fig. 25) are explained in the diagnosis of the genus.

Length of fore wing $4\frac{3}{4}$ –5 mm. Wing expanse 11–11½ mm.

Ceylon, Peradeniya, on tree-trunks. January, 1905, two males and one female. March, 1905, two females. Collected by Mr. E. Ernest Green.

var. *major* n. (fig. 26).

One male differs from the five specimens recorded above by its greater size. The colour is somewhat more whitish, but there are no further differences, so that it probably represents a second more highly developed generation.

Length of fore wing 5.6 mm.; wing expanse 12½ mm.

Ceylon, Maskeliya; on the stem of a bamboo; April, 1905, one male. Collected by Mr. E. E. Green.

Cymatopsocus, Enderl. 1903.

[Ann. Mus. Nat. Hung. Bd. I., 1903, p. 314.]

Cymatop. opalinus, Enderl., 1903 (fig. 98).

[l.c. p. 315, fig. 56 a–m.]

The palpal organ of the second joint of the maxillary palp is—as in the preceding genus—developed not in the form of a sense-club but as a sense-hair (fig. 98 *sh.*). It reaches in this species a remarkable length, being longer than the second joint of the palp.

Further India.

Sub-fam. AMPHIENTOMINÆ.

[Enderlein. Ann. Mus. Nat. Hung. Bd. I., 1903, p. 207 and p. 310.]

TABLE FOR DETERMINATION OF THE GENERA OF AMPHIENTOMINÆ.

1. With 3 ocelli; 2 axillary veins in fore

wing 2.

Without ocelli; 1 axillary vein in fore

wing; r_1 and *sc* of the pterostigma

lie close together. *Stigmatopathus*, Enderl., 1903.

Type:—*St. Horváthi*, Enderl., 1903.

2. Outer border more or less strongly acuminate in front or with a thin, more or less long and acute tail-like appendage in the middle; claws with 2 teeth before the apex; r_1 absent from hind wing .. *Syllysis*, Hag., 1865.

Type:—*S. caudata*, Hag., 1865.

Outer border quite rounded . . . 3.

3. Claws with one tooth before the apex .. 5.
Claws with two teeth before apex .. 4.

4. R_1 present in hind wing (fossil in amber) *Amphientomum*,
Hag., 1856.

Type:—*A. paradoxum*, Hag., 1887

R_1 absent from hind wing (recent) .. *Paramphientomum*, n. g.

Type:—*P. Nietneri*, n. sp.

5. R_1 present in hind wing (recent) .. *Hemiseopsis*, n. g.

Type:—*H. Fülleborni*, Enderl., 1902.

R_1 absent from hind wing (recent) .. 6.

6. Maxillary palp without spur, hind tibiae
with few spurs; very small forms .. *Seopsis*, n. g.

Type:—*S. Vasantasena*, n. sp.

Second, third, and fourth joints of the
maxillary palp with stout spurs;
hind tibia with numerous spurs; very
large species .. *Stimulopalpus* n. g.

Type:—*St. japonicus*, n. sp.

Syllysis, Hag., 1865.

[Hagen. Ent. Mo. Mag., Vol. II., 1865, p. 150; and Verh. Zool.
Bot. Ges. Wien., 1866, p. 203.]

(Type:—*S. caudata*, Hag., 1865).

Occipital border sharp edged, the edge rounded. Front long; antennæ thin and short; three ocelli placed relatively close together. Terminal joint of the maxillary palp slender, not acute; palpal organ of the second joint of the maxillary palp in the form of a sense-club. Claws with two teeth before the apex. Tarsi 3-jointed.

Outer border of the wings between the ends of m_1 and m_2 with an outgrowth (δ), which in the female is produced into a more or less long and acute tail-like process. It is remarkable that in this case the female is characterised in such a marked manner.

There is no pterostigma since the distal portion of the subcosta is lacking. Stigma sac distinct. Median branches very long. Areola postica elongated. Two axillary veins.

In the hind wing, *an* and *ax* end rather near to one another; *media* simple. In the fore wing between the scales are numerous very fine hairs.

Scales slender, sides nearly parallel, ends rounded (fig. 42). Marginal scales (fig. 42, *rs*) very slender, truncate at the end. Scales of the hind wing (fig. 43) very slender, with two long acuminations at the end, which become shorter towards the margin of the wing.

Three relatively large species from Ceylon.

It is thus established with certainty that this important genus does not belong to the Lepidopsocidæ (*cf.* Enderlin, 1903); it is, on the contrary, a typical Amphientomid.

TABLE FOR DETERMINATION OF THE SPECIES OF THE GENUS SYLLYSIS.

1. Fore wings with some broad silver cross bands, gold markings, and a large orange yellow or gold spot in the anterior half of the apical quadrant 2.
Fore wings with numerous fine, sinuous, closely arranged golden cross-bands; over the front and vertex two broad dark brown longitudinal bands . . . *ritusamhara*, n. sp.
2. Vertex with a broad black cross band between the eyes *caudata*, Hag., 1865.
Vertex with two fine parallel dark brown cross bands between the eyes . . . *erato*, n. sp.

Syllysis erato, n. sp. (figs. 2, 37, 38, 42, 43, 55, 95, 102).

Head whitish grayish yellow, glabrous. Across the vertex, uniting the eyes, are two narrow parallel dark brown bands, leaving an equally broad tract between them; the anterior band placed at the front margin of the vertex, runs through the two posterior ocelli and is feebly notched (concave forwards) in the middle; the hinder band is indistinctly concave forwards. Occipital border, sharp edged, the edge rounded, somewhat concave. Suture of vertex very fine, sometimes almost invisible; suture between vertex and front distinct. Front remarkably elongate and very flat. Clypeus relatively small

and unusually flat (only feebly convex), with three wide brown longitudinal streaks, which frequently coalesce, not quite reaching the hinder border and sometimes confined to the anterior half (in poor specimens not be seen). Cheeks lobe-like, expanded below with almost circular margin; at the point of junction with the forehead a diffuse brownish line. Antennæ brownish yellow, the two basal joints and the third joint pale grayish yellow, becoming darker towards the apex. Antennæ approximately half the length of the wing, in the male with close-set long hairs on all sides, in the female only thickly hairy forwards, beset behind sparsely with long hairs. Antennæ inserted close in front of the eye-border.

Ocelli small, reddish brown; interval between the posterior ocelli almost equal in length to the interval between them and the eye-borders.

Eyes smooth, dark brown, with darker bands, generally a golden sheen in the male, glabrous, very slightly convex; the borders are not angulately set off from the vertex, but the eyes pass quite flatly into the vertex; scarcely different in male and female. Temples quite ousted by the eyes.

Upper lip small, strongly retracted. Apical third of the second, the third, and fourth joint of the maxillary palp, pale brown; approximate ratio of the palpal joints as $\frac{1}{5} : 1\frac{2}{3} : 1 : 1\frac{1}{2}$ (fig. 95). Sense-club (fig. 95, *sk*) of the second joint of the maxillary palp short and stout. Inner lobe of the maxilla (fig. 102) with irregular, strongly flattened, and rounded teeth.

Thorax pale, brown-scaled above, with gold coloured scales at the sides. Abdomen, in spirit-specimens, very pale; diffuse grayish brown cross streaks at the segmental junctions; finely and moderately closely pubescent, without scales; apex of abdomen brown. Legs yellowish gray white; the brown colour is distributed as follows:—apex of the coxæ and on the underside of the femora, in each case, a spot in the middle, before the base and before the apex; the latter spot is very feeble in the mid legs and is generally absent from the hind legs; on the upperside of the femora the extreme border of the apex; the fore and mid tibiæ are annulated in the centre by two brown bands in such a manner that three approximately equal uncoloured tracts remain free; in the hind tibiæ these rings expand so that only the extreme apex and base and a narrow uncoloured ring at the end of the second third remain free; the three tarsal joints with the exception of a clear ring in the middle of each and except the extreme apex of the first joint.

Femora compressed, especially the expanded anterior pair. Claws (fig. 55) slender, apex moderately acute; between the two

stout teeth before the apex there is an indication of a minute blunt denticulation; between the base and the first tooth, on the inner side, a row of bristly hairs.

Hinder tibiæ 1.12 mm. long; outside with 3 spurs, inside with 7 spurs, in addition to the terminal spurs of which there are 4 inside and 2 outside; each spur with a ctenidiobothrium which exhibits the same structure as in the first posterior tarsal joint. The length of the first, second, and third hinder tarsal joints is 0.67 mm., 0.07 mm., and 0.09 mm., the ratio being as $7\frac{1}{2} : \frac{7}{5} : 1$. First joint of the posterior tarsus with about 25 ctenidiobothria, which are very broad and arcuate; the marginal bristles are fine hairs; along the arcuate margin there is a row of very small black pigmented points, with two terminal spurs.

Femora and tibiæ, in their whole length, beset with narrow silvery scales (coloured brown on the brown tracts), which are abruptly truncate behind.

Fore wing with a tail-like outgrowth at the outer margin between m^1 and m_2 , which is short and rounded in the male (fig. 37), long and acuminate in the female (fig. 38).

The extraordinarily dense and differentiated scaling of the fore wing occasions an unusual likeness to the marking of a moth's wing, as can be seen from figure 2. The colouration is essentially as follows:—The ground colour is brown; four narrow silvery cross bands, which are acutely notched outwards in the middle, divide the wing into four quarters, the two first bands occurring close beside one another at the end of the first quarter, the third in the middle, the fourth approximately at the end of the third quarter. The posterior halves of the two first bands are golden, much reduced and interrupted, the first not reaching the fore margin; the third is interrupted in the middle, and is considerably wider in the posterior half; the fourth is golden in the posterior half, thin and linear, usually much diffused in the middle. The third and fourth bands are distinctly seamed with black brown in the anterior half; between them about 5 golden streaks run from the anterior margin, in front interrupted nearly equally by brown streaks which soon fuse and disappear behind (hardly $\frac{1}{4}$ of the wing breadth), only the most external of them runs into the angle of the notch of the fourth silver cross band. Between the posterior halves of the third and fourth bands occur irregular golden spots, here and there also silver scales. The anterior half of the outer quarter of the wing is occupied by a roundish reddish golden spot into which a prominent silvery wedge-shaped spot projects from the end of the fore margin, the base of the wedge lying upon the fore margin and its catheti

seamed with black. This seam proceeds inwards into a narrow wedge-shaped spot lying at the margin and is prolonged outwards into a seam at the outer margin which bends inwards at the caudate process and merges into the brown colour of the posterior half of the outer quarter of the wing, which is only interrupted by a roundish golden spot in its outer moiety, two silver marginal spots behind the latter, the inner of which becomes towards the inner side gradually golden, and by a narrow golden spot placed parallel to the end of the fourth cross band; in the inner half occur scattered groups of silver scales and in front at the limit of the golden spot, a deep blackish brown longitudinal spot, which is bounded behind by a diffuse golden line. The scaling of the outer margin is yellowish golden; the caudate process is silvery, its hinder margin black. The base of the wing is yellowish golden. The membrane is tinted pale brownish. Hind wing hyaline, apical angle with very slender scales; ends of the veins and the analis beset with scales. Hind margin hairy; veins and scales pale brownish. Venation and scaling of both wings are described in the diagnosis of the genus. Membrane of the hind wing intensely iridescent, green to red.

Length of fore wing in male 3 mm., in female 4 mm.; expanse of wings in male 7 mm., in female 9 mm.

Ceylon. Peradeniya; on tree trunks, February, 1905. Eighteen males (7 in alcohol) and five females (1 in alcohol); collected by Mr. E. E. Green.

Syllysis caudata, Hag. 1865.

Amphientomum caudatum, Nietner in litt.; Hagen Ent. Mo. Mag., vol. II., 1865, p. 150.

Syllysis caudata, Hagen. Ent. Mo. Mag., vol. II., 1865, p. 151.

Syllysis caudata, Hagen. Verh. Zool. Bot. Ges. Wien, 1866, pp. 204, 210, and 219.

Syllysis caudata, Hag. Enderlein Ann. Mus. Nat. Hung. Bd I., 1903, p. 320.

Hagen, *loc cit.* :—

“ Head bright yellow, with a broad black band between the eyes; ocelli distant; palpi grayish brown; antennæ grayish brown, the three basal joints yellow; thorax brown, bordered on each side and posteriorly with golden scales, brown in the middle; abdomen black; superior wings elongated, the apex prolonged into a point truncated posteriorly, brown, with the scales forming very pretty markings, viz., the base golden, with silvery bands, on the middle of the anterior margin a golden band between two silvery lines bordered with black; at the apex an oblique comma-shaped silvery

mark bordered with black, behind this mark an orange spot partially encircling a black pupil, placed after the apical prolongation; inferior wings hyaline, brown; legs yellow, femora with two black rings nearly obsolete on the posterior pair, posterior tibiae black with a yellow ring before the apex, first tarsal joint with two black rings, the two following brown.

Long. cum alis $4\frac{1}{4}$ mill.; exp. alar. 9 mill. Ceylon. Rambodde (Nietner), in woods.

I have seen but one specimen of this extraordinary species. In all the others the superior wings are oval, the apex scarcely acute, but in *A. caudatum* they are prolonged into a sort of tail. The colours are very bright and the markings very pretty. Probably it will be advisable eventually to place *A. caudatum* in a distinct genus. I propose the name *Syllysis*."

Syllysis ritusamhara, n. sp. (Fig. 3, 39, 40, 54, 96, 111.)

Head clear brownish yellow, with extremely short, fairly dense, fine, silken, recumbent hairs. Along the front and vertex run two parallel dark brown bands which touch the somewhat concave eye-borders laterally and the hinder ocelli inwardly, leaving between them an equally broad clear longitudinal tract free. Occipital margin sharp edged, the edge rounded; somewhat concave. Suture of the vertex very fine. Suture between front and vertex distinct. Forehead long and flat. Clypeus rather small, prominent, blackish brown. Clypeolus narrow, yellow. Upper lip blackish brown, strongly diverted towards the lower side and posteriorly. Cheeks expanded lobe-like below, with arcuate border; separated from the front by a roundish brown spot in which, close in front of the eye-border, the insertion of the antennæ occurs. Antennæ brownish yellow, becoming blackish beyond the middle; in the male on all sides with close and fairly erect long pubescence, in the female with sparser and more oblique pubescence which, on the hinder side, is still sparser and shorter. Ocelli small, dark reddish brown; interval between the posterior ocelli slightly shorter than the distance between them and the eye-borders. Eyes smooth, brownish yellow to reddish brown, generally dark spotted or banded, in the male with reddish gold sheen, glabrous, as in *S. erato*, n. sp., hardly differing in male and female. Temples quite displaced by the eyes. Maxillary palp scaleless, brownish yellow, apex of the third and the fourth joint pale brown; sense-club (fig. 96, *sk*) of the second joint relatively short and stout. Inner lobe of maxilla figured in fig. 111.

Mesothorax black above, parapsidal furrows and hind border yellow, the scaling at these places golden. Abdomen, in spirit-specimens dirty whitish, the segmental junctions brown on the under side, anterior half brown at the sides, apex brown : finely and rather closely pubescent, without scales.

Legs yellowish grayish white, tarsi brownish yellow. The blackish brown coloration is distributed as follows:—The anterior margin of the coxæ, the basal half of the femora on the under side and a spot before the apex, the latter sometimes very indistinct especially on the hind legs; on the upper side of the extreme base and the extreme margin of the apex; a ring before the apex of the mid tibiæ, the hind tibiæ with exception of the base, the apex and a narrow ring in the middle; the base and the apex of the first tarsal joint and the second and third tarsal joints.

Femora flattened, especially the somewhat expanded anterior femora. Claws (fig. 54) slender, apex moderately acute, the tooth nearer to the apex much stouter than the other; between base and first tooth in the middle a ridge-like prominence, between this and first tooth a row of bristly hairs.

Length of hind tibia 1.34 mm.; this carries on the outside three spurs, on the inside nine very short spurs in addition to the terminal spurs (four on the inside, two on the outside); each spur with a ctenidiobothrium, which presents the same peculiar structure as that of the first posterior tarsal joint. The length of the first, second, and third posterior tarsal joint is 0.83 mm. : 0.07 mm. : 0.1 mm.; their ratio is as $8\frac{1}{3}$: $\frac{7}{10}$: 1. First posterior tarsal joint with about 29 ctenidiobothria and two end spurs; each ctenidiobothrium very broad and arcuate, overlapping its neighbour, margin densely hairy. Second posterior tarsal joint with one end spur. Femora and tibiæ in their whole length beset with narrow silvery scales (brown on the brown parts), posteriorly abruptly truncate.

Fore wing tipped with a somewhat elongated but rounded apex in the male (fig. 39), which in the female is drawn out into a long trailing tail-like acumination (fig. 40). The marking of the wing which is produced by the dense scaling is shown in fig. 3 and is essentially as follows:—The ground colour is deep brownish black; the wing is traversed by numerous, irregular, much interrupted, wavy, thin cross bands with golden sheen, the base of the wing, a zone at the hinder border and at the outer border and a central oblique cross band interrupted in the middle remaining free. The middle of the outermost cross bands is silvery. The tail-like elongated wing apex silvery, in the middle at the anterior margin a black spot, which indistinctly radiates posteriorly: behind and

inwards seamed with black: parallel to the inner seam a golden band which turns inwards and ends shortly before the re-entering angle ["einspringende Ecke"] of the outer margin, in which a silvery white spot bordered with golden scales occurs; the black hinder border of the wing apex with fine golden seam. Hinder border except middle and base seamed with gold; wing base golden.

Hind wing hyaline, apical quarter with very slender pale brown scales; the ends of r_{4+5} , m , cu , and an scaly; hinder border long and densely pubescent. Membrane of the hind wing iridescent from green to intense red. Venation and scaling are explained in the diagnosis of the genus.

Length of fore wing in male 4 mm., in female 4.2 mm.; wing expanse in male 9 mm., in female 10 mm.

Ceylon. Peradeniya; on tree trunks; February, 1905. Seven males (6 in alcohol) and eight females (1 in alcohol). Again in March, 1905, seven males and one female; collected by Mr. E. E. Green.

Amphientomum, Hagen. 1856.

Hagen. in Berendt. Benst. Org. 1856., Taf. II., p. 61. Taf. VII., fig. 21. Taf. VIII., fig. 10.

Hagen. Ent. Mo. Mag., vol. II., 1865., p. 148. *Id.* Verh. Zool. Bot. Ges. Wien., 1866, p. 203. *Id.* Ent. Zeit. Stettin., 1882, pp. 268-276. Taf. I., fig. VI., 1-8.

Enderlein, Ann. Mus. Nat. Hung. Bd. I., 1905, p. 310. *Id.* Zoolog. Anz. Bd. 29, 1905, pp. 576-580, fig. 1-5.

Large forms, only known fossil in amber. Differs from the nearly related recent genera *Paramphientomum*, n. g., *Stimulopsis*, n. g., and *Scopsis*, n. g., by the absence of the radial branch r_1 from the hind wing; from the two last-named genera it also differs in the fact that the claws carry two teeth before the apex. Maxillary palp without spurs.

TABLE OF THE SPECIES.

1. Scales of fore wing abruptly truncate at the end 2.
Scales of fore wing emarginate at the end .. *colpolepis*,
Enderl. 1905.
 2. These scales shorter and broader, lateral
borders converge towards the base .. *paradoxum*,
Hag. 1856.
- These scales longer and narrower, lateral borders
parallel *leptolepis*, En-
derl. 1905.

Amphientomum colpolepis, Enderl. 1905.

A. paradoxum. Hag. 1856. Hagen. Ent. Zeit. Stettin. 1882, p. 268 partim.

A. colpolepis, Enderlein, Zool. Anz. Bd. 29, 1905, p. 577, figs. 2 and 3.

In the fore wing the cross vein between radial ramus and media is longer and more oblique than in *A. paradoxum*, Pick. Hag. The pterostigma appears to be shorter and narrower. In the hind wing the base of the radial ramus is absent so that the latter appears to arise from the media; r_1 reaches the anterior margin near the end of r_2-3 .

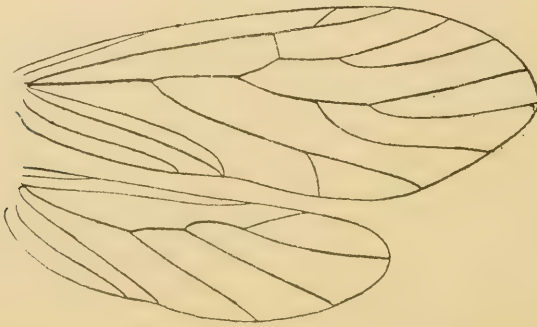


Fig. 1. *Amphientomum colpolepis*, Enderl.

Venation of fore wing and hind wing, $\times 27$.

The distal portion of the subcosta, which forms the basal boundary of the pterostigma, is clearly recognisable and fairly distant from the point of origin of the radial ramus.

Terminal joint of maxillary palp relatively slender. First joint of posterior tarsus with about 27 ctenidia; the same joint 0.7 mm. long, second joint 0.06 mm., third joint 0.11 mm.

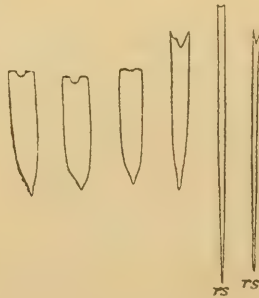


Fig. 2. *Amphientomum colpolepis*, Enderl.

Scales of fore wing; *rs* marginal scales $\times 280$.

Scales of fore wing slender, at the end smoothly truncate, and in the middle more or less deeply emarginate; the marginal scales (*rs*) have two more or less long apices. Some scales near the margin, which are somewhat elongated, sometimes show an indication of a third denticulation. The scaling of the fore wing appears blackish with only a few small marginal spots between the ends of the veins.

Length of fore wing about 3.15 mm.

Found in amber of East Prussia. One specimen, No. 91 of the Künow Collection in the possession of the Paleontological Institute of the Royal Museum of the Natural History; also one of the specimens which Hagen assigned to *Amph. paradoxum*, Hag., in his new monograph on the Psocidæ in amber (Stett. Ent. Z., 1882, pp. 217-237 and 265-300).

Amphientomum paradoxum, Pict. Hag. 1856. *A. paradoxum*. Hagen im Berendt. im Bernst. bef. Organismen II., 1856, p. 61, Taf. VII., f. 21. Taf. VIII. f. 10; Hagen. Ent. Z. Stettin., 1882, pp. 268-276. Taf. I., fig. VI., 1-8; Enderlein, Zoolog. Anz. Bd. 29, 1905, p. 579, figs. 1, 4, and 5.

In all the available material examined by Hagen in 1882, the base to the radial ramus of the hind wing is constantly present. Hagen omits this stretch of vein from his figure and has presumably selected the hind wing of object No. 91 (*A. colpolepis*, Enderl.), which is preserved rather favourably, and has correlated it with

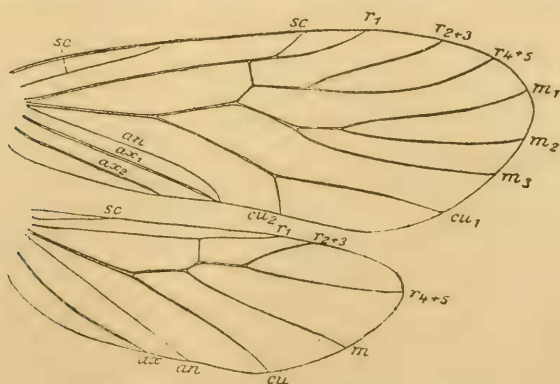


Fig. 3.—*A. paradoxum*, Hag. $\times 27$.

Venation of fore wing and hind wing.

the fore wing of the typical *A. paradoxum*, Hag. It is clear with what caution the combination of several fragments should be undertaken.

r_1 always reaches the margin of the hind wing near the end of $r_2 \times 3$.

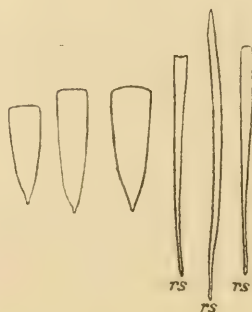


Fig. 4.—*A. paradoxum*, Hag.

Scales of fore wing $\times 280$; *rs* = Marginal scales.

The scales are moderately slender, and usually expand feeble towards the end, where they are directly or somewhat roundly truncated. The slender marginal scales (*rs*) rarely show an extremely shallow emargination at the end (*cf.* fig. 4). The distal part of the subcosta, which closes the pterostigma in the fore wing, appears to be partly present in this species, and partly absent. It is certainly present in Nos. 81, 84, 85, and 95, whereas otherwise it is apparently lacking (Nos. 87, 89, 92).

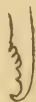


Fig. 5.—*A. paradoxum*, Hag. Claw $\times 280$.

Claw with two teeth before the curved apex; before the teeth three or more bristle-like hairs (fig. 5 from No. 89). The length of the first joint of the posterior tarsus varies from 0.85–0.88 mm.; that of the second joint from 0.08–0.09 mm.; that of the third from 0.1–0.12 mm.; the number of ctenidia on the first hind tarsal joint varies between 29 and 32; one specimen has 34 (No. 95).

The above statements supplement Hagen's detailed description (*l.c.* 1882). *Locality*: In East Prussian amber.

I had at my disposal Nos. 81, 82, 84–87, 89, 92, 93, 95, and 162 (nymph) from the Künow Collection. Nos. 81 and 85 present a quite colourless gold gleaming scaling; these animals had probably been sun-dried and bleached before they were completely saturated with the resin.

Amphientomum leptolepis, Enderl. 1905. *A. paradoxum*, Hagen. Ent. Z. Stettin, 1882, p. 268, partim. *A. leptolepis*, Enderlein Zool. Anz. Bd. 29, 1905, p. 580, fig. 6.

One specimen, closely resembling *A. paradoxum* in size and wing marking, differs in the very long, slender, and narrow form of the scales of its fore wing (fig. 6); the sides appear to be quite parallel.

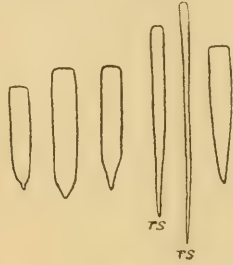


Fig. 6.—*A. leptolepis*, Enderl. Scales of fore wing $\times 280$ *rs* = Marginal scales.

In addition, the number of the ctenidiobothria of the first hind tarsal joint reaches the number of about 36, which I have not observed in *A. paradoxum*. The length of the first hind tarsal joint is about 0.8 mm.; of the second 0.1 mm.; of the third 0.11 mm.

I leave it doubtful whether the specimen under reference represents a separate species or whether it is to be regarded as a variety of *A. paradoxum*, Hag.

In East Prussian amber. No. 94 of the Künow Collection.

Paramphientomum, n. g.

Type: *P. Nietneri*, n. sp.

Closely related to the fossil genus *Amphientomum*, Hag., from which it differs by the absence of the first radial branch (r_1) in the hind wing. Claws with two teeth before the apex. Maxillary palp (2nd–4th joints) with spurs.

A large form which is extraordinarily similar in marking to *A. paradoxum*.

One species from Ceylon.

Paramphientomum Nietneri, n. sp. (figs. 7, 27–29, 34, 56, 112.)

Head clear brownish yellow, dull, and glabrous, almost hemispherical since all parts (eyes, clypeus, &c.) are developed without convex projections and without projecting edges; the occipital margin is very sharp, steeply descending; the sharp edge slightly rounded and straight. Suture of vertex very fine; middle of the

vertex with two broad brownish longitudinal streaks, leaving free only a very fine yellowish line along the suture. Temples absent. Eyes relatively small, not prominent, hairless, brownish, with red-golden sheen. Cheeks strongly arched, expanding below, whitish yellow. Clypeus relatively small, set off by a fine groove, slightly convex. Clypeolus narrow, pale. Upper lip smooth, black. Maxillary palp pale yellowish, end joint slender and brown; second joint with two spurs, third with three, fourth with two strong and relatively long spurs.

Ocelli (fig. 34) very small, the anterior ocellus half the diameter of the posterior ocelli; the interval between the latter about half as great as the interval between them and the eye-borders. Suture between forehead and vertex absent.

Antennæ thin, about three-fourths the length of the fore wing, brown, the three first joints clear brownish yellow, fairly closely and fairly long pubescent, at the base chiefly pubescent in front only (probably all specimens female). Inner lobe of maxilla represented in fig. 112.

Mesothorax brown above, beset with gray scales which have mostly dropped off. Abdomen of dried specimens brown. Legs clear brownish yellow to whitish yellow. The following parts are dark brown:—The extreme upper apex of the femora; the tibiæ with exception of the apex and of a ring in the middle, in the hind tibiæ with exception of the base also; the first tarsal joints except the apical third in the fore leg, and the apical half and more in the middle and hind legs. Femora little expanded, the hind femora not expanded. Hind tibiæ with a great number of almost upright, short (long in comparison with *syllisis*, &c.) spurs which are distributed on all sides of the tibia. The length of the anterior tibia is 0.57 mm., of the middle 0.63 mm., and of the posterior tibia 1.23 mm. Claws (fig. 56) slender with two teeth before the apex and inwardly outside the edge with fine hairs. The length of the first, second, and third fore tarsal joints respectively is 0.42 mm., 0.08 mm., 0.01 mm.; of the mid tarsal joints 0.45 mm., 0.07 mm., 0.09 mm.; of the hind tarsal joints 0.85 mm.; 0.1 mm., 0.14 mm. The ratio of the hind tarsal joints is therefore as $8\frac{1}{2} : 1 : 1\frac{2}{5}$. First hind tarsal joint with about 27 ctenidiobothria. Femora, tibiæ, and first tarsal joints scaly.

The closure of the pterostigma fails through the absence of the distal piece of the subcosta (fig. 27). Stigma sac well developed, short and thick. Membrane of fore wing brown, apical angle almost hyaline. Veins brown, those of the apical third dark brown. In consequence of the scaling, a gray silver ground colour is present,

which is interrupted by black brown marking (fig. 7), rather variable; the veins are generally seamed with yellow, feebly golden scales, which more or less disappear in dark specimens, but numerous yellow scales are always found. The brown marking is illustrated in fig. 7, and is very similar to that of *Amphientomum paradoxum*, Hag., from the amber; frequently it spreads still more over the wing, sometimes it becomes somewhat reduced especially in the apex. In the hind wing the scaling of the outer margin is only slightly continued in the apex into the membrane, the latter iridescent intense violet, red to golden.

The scales of the fore wing are long, slender, with parallel sides and moderately emarginate ends (fig. 28); marginal scales slender, rather narrow, with two generally very long apices. Scales of the outer margin of the hind wing similarly deeply bifid at the end.

Length of fore wing 2.6–3.4 mm.; expanse of wings 6–8 mm.

Ceylon, Peradeniya, on moist walls. January, 1905, sixteen specimens, probably all female. June, 1905, one specimen. Collected by Mr. E. E. Green.

I have dedicated this species to Mr. Nietner, who collected, with so much interesting material of other orders in Ceylon, the examples of the Amphientomides and Lepidopsocids diagnosed by Hagen.

Stimulopalpus, n. g.

The first radial branch is lacking in the hind wing. Maxillary palp (fig. 130) with spurs at the second, third, and fourth joints. Claws (fig. 128) with one tooth before the apex. Hind tibia with numerous spurs.

One large species from Japan.

Scales of the fore wing (fig. 129) deeply emarginate, especially the marginal scales (*rs*), which have two long to very long apices; scales of hind wing resembling the latter.

Stimulopalpus japonicus, n. sp.

Plate C., Figs. 127–130.

Head pale grayish white; upper lip and clypeus dark brown, as are also the sides of the forehead and a narrow median cross bar before the anterior ocellus upon the forehead.

The vertex is brown except for a large round spot in the middle of each half, and the distinct suture of the vertex. The neighbourhood of the ocelli is grayish white.

Antennæ very thin, about three-fourths the length of the fore wing; dark brown with exception of the first three joints; sparsely

pubescent. Terminal joint of the maxillary palp brown; sense clubs (fig. 130 *sk*) short but stout; second and fourth joints with three spurs, third joint with four (fig. 130, *sp*₁ to *sp*₁₀). Anterior ocellus much smaller than the two posterior; the interval between the eyes and the posterior ocelli is about twice as great as that between the latter. Eyes dark brown, hairless. Clypeolus very narrow and indistinct.

Thorax pale, mesothorax brown above. Scales are lacking on the thorax, but they have probably dropped off from the specimens, all of which are preserved in spirit. Abdomen very pale, apex dark brown.

Legs pale gray white; the following parts are brown: the coxæ, the extreme base of the hind femora, a ring through the middle of the basal half of the tibiæ occupying about one-third of their length, the distal half of the tibiæ except their apical third, the basal half of the first tarsal joint (in the posterior foot rather less) and the second and third tarsal joints. Claws (fig. 128) pale yellowish, the tooth before the apex stout; before the tooth five setæ, the last of which is very long. Tibiæ and first tarsal joints beset with relatively short and moderately emarginate scales on the posterior and outer sides of the brown places, as shown in fig. 129 *b*. Hind tibia with about 18 spurs in addition to the 6 terminal spurs (fig. 127). On the front of the first hind tarsal joint, a row of eight small spurs (fig. 127 *a-h.*), and two terminal spurs besides; first hind tarsal joint with about 26 ctenidiobothria. Second hind tarsal joint with one terminal seta. Ratio of the hind tarsal joints as 9 : 1 : 1½.

The closure of the pterostigma fails through the absence of the distal piece of the subcosta. Stigma sac short and thick, nearly globular. Membrane of fore wing brown, apical fourth hyaline, colourless. Veins brown, those of the apical third dark brown, *r-r*₁ dark brown in the entire length, only the base pale brown. On each side of the cross vein between radial ramus and media a large roundish, hyaline, nearly colourless spot (which is not present in *Paramphientomum Nietneri*, Enderl.). The scales of the wings have to a large extent fallen off, as the material is preserved in alcohol; the wing-marking cannot therefore be recognized; but they have still so far remained that their distribution in respect of scale form can be ascertained.

The scales of the fore wing (fig. 129 *a*) are extraordinarily slender and long, at the end sharply and deeply bifid; near the outer margin (fig. 129 *b*) on the contrary they are shorter and broader and less deeply incised. The marginal scales (fig. 129 *rs*) are very long, strongly expanding towards the end and deeply to very deeply bifid. Those of the hind wing resemble the latter.

Length of fore wing about 3.6 mm.

Japan, Okayama, Herbst, 1904; twelve nymphs and five females. Collected by Hans Sauter.

The nymphs have 2-jointed tarsi. They are pale gray white, sprinkled above with gray brown. Antennæ brown, eyes gray black. Colour of the legs as in the imago. Wing sheaths long and narrow, almost equal in length to the abdomen, the hind wings rather shorter. The colour of the latter is pale yellowish gray white, that of the fore wing with a brown cross band respectively at the end of the first and second third.

Seopsis, n.g.

Type:—*S. vasantasena*, n. sp.

First radial branch in hind wing absent. Maxillary palp without spurs. Claws with one tooth before the apex.

Three small species in Ceylon.

Scales of fore wing mostly abruptly truncate at the end, only feebly emarginate in *S. vasantasena* (fig. 31); marginal scales and scales of hind wing more or less deeply or flatly incised.

TABLE OF SPECIES OF THE GENUS SEOPSIS.

- | | |
|--|---------------------------------|
| 1. Head in front with metallic green glitter. | |
| Fore wing with silvery scaling and black-brown marking | <i>metallops</i> , n. sp. |
| Head without metallic lustre | .. 2. |
| 2. Fore wing dark brown with golden marking | <i>superba</i> (Hag 1865). |

Fore wing silvery with irregular golden longitudinal band in the middle; hinder border with irregular dark brown marking; anterior border with three brown cross bands (of which the middle one is clear gray brown) which scarcely reach the middle of the wing; before and behind these a dark brown marginal spot <i>vasantasena</i> , n. sp.
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Seopsis vasantasena, n. sp. (Figs. 5, 30, 31, 35, 58, 103).

Head clear brownish yellow, over the vertex four rather narrow reddish brown longitudinal streaks, the two submedian streaks very close to the distinct suture of the vertex: they often coalesce especially in the central portion; the two lateral streaks are near to the eye-borders, often touching them. These four brown

longitudinal bands are continued upon the relatively narrow forehead, but never coalesce there. Over the middle of the convex clypeus passes a broad brown band divided into two parts in the middle line by a fine yellow line. Clypeolus yellowish. Upper lip black-brown, at the sides brown. Cheeks whitish. Inner lobe of maxilla shown in fig. 103. Maxillary palp without spurs, whitish, the first joint and basal half of second joint brown. Eyes relatively small, black, frequently pale speckled or banded, hairless. Ocelli (fig. 35) very small, very near together. Occiput steeply descending, occipital margin rounded and emarginate in the middle. Antennæ thin, about two-thirds the length of the wing, black-brown, the three first joints reddish brown; rather sparsely pubescent, somewhat more densely towards the apex; the lengths of the eleven (antennary) joints of the flagellum in millims. are: 0·09, 0·12, 0·14, 0·12, 0·11, 0·09, 0·08, 0·08, 0·05, 0·05, 0·06.

Thorax brown, with golden scales in the middle, some silver scales at the side, most of the scales lost. Abdomen of dried specimens brownish. Legs brown, the following parts clear brownish yellow: the apices of the coxæ, the trochanters, the extreme apex of the femora below, the extreme base of the tibiæ, the apices of the tibiæ and first tarsal joints, and the very short spurs standing out on all sides of the posterior tibiæ. The length of the anterior tibia is 0·47 mm., that of the middle tibia 0·47 mm., of the hinder tibia 1 mm.

The lengths of the tarsal joints of the fore foot in millims. are 0·3, 0·05, 0·08; of the mid foot 0·33, 0·05, 0·07; of the hind foot 0·52, 0·06, 0·08. The ratio of the hind tarsal joints is therefore as $6\frac{1}{2} : \frac{3}{4} : 1$. First hind tarsal joint with about 18 ctenidobothria. Claws (fig. 58) relatively small, one tooth before the apex, which is very long and acute, before the tooth about 7 setiform hairs. Femora, tibiæ, and first tarsal joints squamous.

The venation is illustrated in fig. 30. Pterostigma very short and small, far removed from the ramification of the radial ramus, the distal portion of the subcosta remote. Peduncle of the radial fork nearly equal to the length of r_{4+5} . The basal portion of the radial ramus is lacking in the hind wing, and the radial ramus apparently arises from the media; r is absent (r ends at the place where the radial ramus should have been given off). The marking of the fore wings produced by the scaling is as follows:—Ground colour silvery, a golden longitudinal band through the centre of the wing which spreads out in the apical half as far as the hinder margin and is interrupted by two or three silver spots; in the anterior half of the wing, in front of the line joining the most anterior portion of

the root of the wing to the wing apex, occurs near the middle a clear, gray brown, rather broad cross band which runs from the anterior margin obliquely backwards and ends directly truncate. In the anterior half of the wing the following places are dark brown :—A narrow brown longitudinal band from the anterior margin of the wing base, in the first half lying against the anterior border, in the second half directed obliquely backwards and towards the wing apex ; close beside the gray brown cross band on the inner side of it a nearly equally broad parallel cross band, outside the gray brown band and also close beside it another very narrow parallel cross band. Outside the latter a dark brown marginal spot produced acutely backwards, outside this again a minute marginal spot over the apex. Hinder border with a dark brown zigzag seam, broad at the base, expanding at the end of the first third to an acute triangle, the apex of which reaches to about the middle joint between posterior and anterior margin, then becomes strongly attenuated ; it is interrupted in the middle and, before ending before the apex, encloses one or two golden spots. Hind wings hyaline, veins pale brown, apical border with long scales, hinder border with very long hairs ; in the membrane scales only occur at the anterior margin of the apex upon a very narrow zone (fig. 5) ; membrane blue to intense red violet iridescent to golden yellow.

The scales of the fore wing (fig. 31 *a*) are relatively slender, the sides parallel, feebly emarginate at the end ; the marginal scales are very narrow and long, strongly bifid at the end (fig. 31 *β*) ; the scales of the hind wing are slenderer and attenuate gradually toward the base and are at the end usually more or less emarginate or smoothly truncate (fig. 31. *γ. δ. ε.*), the marginal scales (fig. 31. *ξ.*) like those of the fore wing, though usually less strongly bifid at the end.

Length of fore wing 2 mm., wing expanse 4½ mm.

Ceylon. Peradeniya. January, 1905 ; on the outer surface of walls and verandahs ; 13 specimens : collected by Mr. E. E. Green.

Seopsis superba (Hag., 1865).

(Figs. 6, 32, 36, 123.)

Amphientomum superbum, Hagen, Ent. Mo. Mag., vol. II., 1865, p. 150.

Perientomum superbum, Hagen, Verh. d. Zool. Bot. Ges. Wien., 1866, p. 210.

Perientomum superbum, Hag., Enderlein, Ann. Mus. Nat. Hungar., Bd. I., 1903, p. 322.

Seopsis superba (Hag.) *m.*

Vertex yellowish brown to reddish brown, in the middle a dark brown longitudinal band which is sometimes crossed in the centre by a more indistinct transverse band; a narrow seam at the inner borders of the eyes. Suture of the vertex fine. Ocelli relatively close together, the interval between the two posterior ocelli one-third to one-fourth of the interval between them and the eye-borders. Forehead dark red-brown, with delicate gray pubescence. Clypeus black-brown with very fine gray pubescence, moderately convex. Clypeolus usually clear yellowish, short. Labrum black. Maxillary palp without spurs, black; end-joint, except its extreme base, whitish yellow. Antennæ about two-thirds the length of the fore wing, black-brown, the four first joints dark red-brown, the apex of the third and fourth joint, sometimes also the apex of the second joint (second basal joint), very pale brownish yellow. The length of the eleven (antennary) joints of the flagellum are in millims.: 0·15, 0·17, 0·2, 0·2, 0·16, 0·13, 0·1, 0·1, 0·07, 0·06, 0·07. Eyes fairly large, black, sometimes with golden lustre, glabrous. Temples displaced.

Thorax black above, covered with golden scales, especially behind. Abdomen in the dried animal blackish. Legs black, ends of the coxæ, the trochanters, the apices of the femora, tibiæ, and first tarsal joints clear brownish yellow to whitish yellow with golden lustre; the apices of the first tarsal joints are often only at the extreme tip pale coloured; in the hind legs this clear colour becomes sometimes almost entirely obliterated. In clearer specimens the three tarsal joints incline to a pale colouration. The length of the anterior tibiæ is 0·5 mm., of the middle tibiæ 0·48 mm.; and of the hind tibiæ 0·95 mm. The lengths of the tarsal joints of the fore foot in millims. amount to: 0·28, 0·05, 0·08; of the middle foot, 0·32, 0·07, 0·08; of the hind foot 0·6, 0·08, 0·1. Ratio of the posterior tarsal joints as 6 : $\frac{1}{3}$: 1. Claws slender, with one rather stout tooth before the apex. First hind tarsal joint with 23 ctenidiobothria. Femora, tibiæ, and first tarsal joints squamous. The posterior femur is shown in fig. 123.

Venation illustrated in fig. 32. Pterostigma very short and small, distal portion of the subcosta distinct. The basal part of the radial ramus in the hind wing is lacking (the ramus apparently arising from the media); r_1 is absent and r ends at the place where the radial ramus should begin. The pattern produced by the scaling of the fore wing (fig. 6) is the following:—Black brown to brown with golden marginal spots between the ends of the veins, a narrow golden band (which is often broken up into points) near the outer margin, and parallel to the latter; in the middle of the anterior

margin a large golden spot which radiates diffusely through the wing to the hinder margin ; at the nodulus a large golden spot which usually radiates indistinctly and diffusely towards the middle of the anterior margin : wing base golden : at various places isolated golden scales : the marginal spot of the middle of the anterior margin and that between the ends of r_1 and r_{2+3} are generally the largest of the wing, sometimes the remaining golden marking decreases in proportion to these, with the exception of the outer marginal spots. In the hind wing the membrane of the apical zone with clear brownish scales : membrane red to intense golden yellow, with greenish golden yellow iridescence.

Scales of the fore wing (fig. 36 *a*) relatively broad and short, at the end smoothly truncate, the marginal scales (fig. 36 *β*) slender, relatively broad and emarginate at the end ; scales of the hind wing (fig. 36. *γ. δ. ε.*) similarly emarginate.

Length of fore wing 2.2 mm., wing expanse $4\frac{1}{2}$ mm.

Ceylon. Peradeniya, January, 1905, one specimen on a tree trunk ; February, 1905, two specimens on tree trunks ; March, 1905, one specimen on a tree trunk ; collected by Mr. E. E. Green.

Scopsis metallops, n. sp.

(Figs. 4, 33, 57, 92, 93, 121.)

Head deep dull sammet black, rarely brownish black ; clypeus, forehead, and frontal margin of the vertex rather thickly covered with a microscopic pubescence having a strong metallic green lustre : on the clypeus this pubescence forms very fine closely packed parallel longitudinal streaks. Over the middle of each half of the vertex passes a flat but very distinct longitudinal impression, which is continued upon the not very long forehead, where it marks off a roundish median prominence which carries in the middle a small roundish clear yellowish brown spot : in the middle of each of the impressions of the vertex occurs an equally large and similarly coloured spot. These three clear round spots lie in the angles of an imaginary isosceles triangle, whose apical angle is little short of 60° , and they are extraordinarily deceptive, resembling the ocelli when examined with a low power lens. The actual ocelli are very small and shine like orange yellow glass beads ; the anterior is a little larger : the distance between the two posterior ocelli is about half as great as their distance from the eyes. Clypeolus clear yellowish brown. Upper lips glossy brown black, rarely brown. Occiput steeply descending, but at the same time strongly rounded. Suture of the vertex very fine, sometimes pale brown behind. Eyes fairly large, hardly prominent. Antennæ moderately thin.

black, about three-fourths length of fore wing, very sparsely beset with scattered hairs; the lengths of the eleven (antennary) joints of the flagellum in millims. are : 0·22, 0·24, 0·28, 0·23, 0·16, 0·1, 0·08, 0·09, 0·1, 0·11. Inner lobe of maxilla shown in fig. 92; maxillary palp without spurs (fig. 93); organ of maxillary palp (sense-club, fig. 93 *sk*) slender.

Thorax dull brownish black; whether it has had scales above cannot be asserted since all examples are badly rubbed, still here and there a single silver scale appears to be present. Legs brownish black; the following parts are clear brownish yellow:—Apices of the coxæ, the trochanters, the apex of the hind femur, the base of the hind tibia; a narrow ring on the tibiæ near the end of the first third, in the hind tibia at the end of the first fourth, and the apices of the tibiæ. The short spurs which stand on all sides of the hind tibia (fig. 121) are yellowish.

The length of the anterior tibia is 0·67 mm., of the middle tibia 0·72 mm., of the hind tibia 1·33 mm.

The lengths in millims. of the tarsal joints are : in the forefoot 0·5, 0·08, 0·1; in the middle foot, 0·55, 0·08, 0·1; in the posterior foot, 0·77, 0·08, 0·1. The ratio of the hind tarsal joints is therefore as $7\frac{3}{4} : \frac{4}{5} : 1$. First hind tarsal joint with about 23 ctenidiobothria. Claws (fig. 57) very large, tooth before the apex broad and stout, the five or six hair-like setæ between the basal angle and the tooth, very stout. Femora, tibiæ, and first tarsal joints beset with slender scales.

Membrane of the fore wing dark blackish brown. Pterostigma very slender and narrow; the distal portion of the subcosta which limits the pterostigma distinct but very short, arising approximately in the middle of the length of r_1 , which here forms a feeble angle. Peduncle of the radial fork as long as $r_4 + r_5$ and about twice as long as the media between cross vein and first bifurcation. Areola postica rather high and relatively short, cu_2 long, about twice as long as cu_1 . The pattern produced by the scaling of the fore wing, which is almost entirely rubbed away in most of the specimens and is to some extent well preserved in one example only, is as follows:—Ground-colour whitish gray with silvery lustre. The following parts are black:—The base (more extended behind), a cross band through the middle and another through the end of the third quarter, as well as the apex; all the dark markings are much interrupted by roundish silver spots; the markings of the apical half are united by irregular black anastomoses.

Scales of fore wing (fig. 33) very broad, the sides attenuating towards the base, with feebly arcuate almost directly truncate

